

## ABSTRACT

Apparatus is disclosed for steering a directional audio beam that is self-demodulated from an ultrasound carrier. The apparatus includes means for modulating a carrier signal with an audio signal and means for adjusting the amplitude and phase of at least one of the audio signal and/or the carrier signal to steer the audio beam to a desired direction. The apparatus also includes means for generating an ultrasound beam in the desired direction driven by the modulated carrier signal. The apparatus may include means for weighting the audio and/or carrier signal by a zeroth order Bessel function to synthesize a Bessel distribution source. A corresponding method for steering a directional audio beam is also disclosed. A harmonic generator may be used to generate harmonics of low frequencies in the audio signal. The harmonics may provide (upon demodulation) a psycho-acoustic impression of improved perception of low frequencies. Further, a modulated ultrasonic signal or an unmodulated audio signal may be band-passed into two or more different band-limited signals. The band-limited signals may be amplified and transmitted by ultrasonic transducers having mechanical resonance frequencies substantially equal to a characteristic frequency of the band-limited signals. Ultrasonic processing of the audio signal may include square root methods without generating large numbers of harmonics.